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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/069,086

07/08/2002

Josef Weidmann

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9101

26646

7590

12/10/2004

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EXAMINER

JUBA JR, JOHN

ART UNIT

PAPER NUMBER

2872

DATE MAILED: 12/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/069,086

Applicant(s)

WEIDMANN ET AL.

Examiner

John Juba, Jr.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 08 July 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 38-56 (as renumbered under §1.126) is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 38-44 and 46-56 is/are rejected.
- 7) ☒ Claim(s) 45 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 February 0202 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☐ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>2/5/02 &amp; 3/11/03</u> | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION*****Priority***

Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Germany on August 5, 1999. A copy of the certified priority papers has been received from the International Bureau.

***Information Disclosure Statement***

Applicants' Information Disclosure Statements of 5 February 2002 and March 11, 2003 have been fully considered. The examiner has annotated the earlier of these to reflect that no English-language abstract was provided with the non-English-language documents cited.

***Claim Numbering***

The clerical staff did not enter the "Revised Claims" numbered 1 – 19 filed on February 5, 2002. Apparently the staff did not find an express instruction to do so. Thus, this application has been treated as having been filed with original claims numbered 1 – 18. In response to Applicants' instructions on February 5, 2002 to cancel the original claims and add new claims 20 – 38, the clerical staff entered the new claims, but under 37 C.F.R. §1.126, renumbered claims 20 – 38 as 19 – 37. In response to Applicants' instructions on July 8, 2002 to cancel claims 20 – 38 and to add new claims 39 – 57, **new claims 39 – 57 were entered and renumbered as claims 38 – 56**. The corresponding claim dependencies have been amended in accordance with

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the new claim numbering. In responding to this Office action, kindly refer to this new claim numbering. Any claims subsequently added should begin with claim 57. The examiner apologizes for any inconvenience.

### ***Specification***

Applicants' substitute specification filed February 5, 2002 has been entered. The amendment filed February 5, 2002 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention.

The added material which is not supported by the original disclosure is as follows: The incorporation of the article by Zubel, et al (Silicon Anisotropic Etching in Alkaline Solutions II, Sensors and Actuators, A 70 (1998), pp. 260 – 268) by reference thereto at the end of the second paragraph on Page 7 of the substitute specification, impermissibly imports new matter into the specification that was not part of the original disclosure. It is clear that one of ordinary skill would have been enabled as to the specific embodiment discussed in connection with this article, since the article has been published. However, incorporation of the entirety of the article into the specification is impermissible since the article contains subject matter not part of the original disclosure. An example of the new matter would be the preferred etching temperatures discussed by Zubel, et al.

Applicant is required to cancel the new matter in the reply to this Office Action.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 38 – 44, 46 – 51 and 56 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawama, et al (U.S. Patent number 5,725,006). Referring *initially* to Figure 2 and the discussion of the first embodiment, Kawama, et al disclose a reflection graduation (graduated reflector) comprising

a silicon substrate (1);

a first subsection (“textured area” 13) disposed on the substrate and having etched oblique surfaces positioned such that light beams directed incident to the surfaces cause no retroreflection; and

a second subsection (“smooth area” 12) having relatively higher reflecting properties (along the direction of normal incidence) as compared to the first subsection.

Referring to the discussion of the second embodiment and Figure 8, Kawama, et al disclose that a plurality of first and second subsections may be provided with varying frequency across the surface to provide graded reflectivity, and that the inclined surfaces may be provided as a plurality of adjacent V-shaped grooves (“channels”) or quadrangular pyramidal indentations.

With regard to claim 39, the first direction (of alternation) may be taken as left to right in Figure 8, where horizontally oriented V-shaped grooves (identified with diagonal cross-hatching 20) are alternated in several rows with vertically-oriented V-shaped grooves (19). In this Figure, the "first" subsections may be regarded as those with the vertically oriented V-shaped grooves such that the groove orientation is perpendicular to the "first" direction (left to right). Similarly, in the center two rows of Figure 11, "first" subsections (34) have V-shaped grooves oriented perpendicular to a "first" direction (left to right), along which two relatively small first subsection alternate with a plurality of second subsections (35). In each instance the second subsections (horizontally oriented grooves) have a relatively higher reflecting property along a vertical viewing direction (37) than do the first subsections.

With regard to claim 40, the first embodiment discloses pyramids arranged with a regular pitch, and disclosed that the V-shaped grooves may be a series of grooves similarly arranged. The *character* of the grooves as having regular spacing is fairly illustrated, and the discussion of a "pitch" fairly conveys that the features are regularly spaced.

With regard to claim 41, Kawama, et al are using KOH to etch monocrystalline silicon, with a preferred crystal orientation. One of ordinary skill would appreciate that Kawama, et al are referring to preferential etching. Although the prior art does not *expressly* disclose first and second surfaces of the V-grooves as being oriented at an angle of approximately 72° to one another, the same materials are used as in the present application. Thus, the examiner has reasonable belief that this feature is

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inherent in the prior art. If such is not the case, then applicant should present evidence that the prior art does not possess this characteristic. *In re Swinehart*, 169 USPQ 226 (CCPA, 1971).

With regard to claim 42, Kawama, et al disclose monocrystalline silicon with crystal faces along the [100] direction. Thus, whichever of the subsections are regarded as the "first" subsections, it is believed that there is at least one embodiment in which a "direction of the monocrystalline silicon" is along the "first" direction.

With regard to claim 43, several of the alternating regions in Figure 11 are of the same width.

With regard to claim 44, the boundaries of the first subsections can be arbitrarily drawn such that each first subsection includes a at least one secondary V-shaped groove borrowed from a neighboring second subsection such that the secondary groove extends in the second direction along substantially the entire width of the first subsection.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawama, et al (U.S. Patent number 5,725,006), in view of Zubel, et al ("Silicon

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anisotropic etching in alkaline solutions II"). As set forth above for claims 48 – 50, Kawama, et al disclose the invention substantially as claimed. However, Kawama, et al perform the etching using potassium hydroxide (KOH) alone, and do not disclose the use of KOH in solution with isopropanol (IPA).

In the same field of endeavor, Zubel, et al disclose a method of forming inclined surfaces on the surface of a silicon substrate. Zubel, et al teach that the use of KOH alone leads to surface irregularities on the etched surfaces, whereas the use of KOH in solution with IPA leads to a mirror-like finish on the inclined surfaces.

It would have been obvious to one of ordinary skill to use a solution of KOH and IPA to etch the substrate of Kawama, et al, in the interest of providing a mirror-like finish on the inclined surfaces as taught by Zubel, et al. Kawama, et al clearly prefer smooth inclined surfaces so that the small amount of light that is reflected is reflected in the same direction (Col. 8, lines 18 – 24), whereby good contrast is observed.

Claims 52, 54, and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawama, et al (U.S. Patent number 5,725,006), in view of Flanders (U.S. Patent number 4,287,235). As set forth above for claims 48 – 51, Kawama, et al disclose the invention substantially as claimed. However, Kawama, et al do not particularly disclose the etching mask as including chromium (claim 52), an etching process that continues until the V-shaped grooves are completely formed (claim 54), or the step of removing the mask (claim 55).



In the same field of endeavor, Flanders discloses a method of etching V-grooves a silicon substrate using potassium hydroxide. Flanders forms an etching mask of silicon nitride covered with chromium, whereby the chromium can be patterned using a photoresist and used as an etching mask for the silicon nitride, which in turn is used as the etching mask for the silicon substrate. It is clear that the etching continues until the each of the V-shaped grooves is completely formed. Subsequently the mask is removed (Col. 2, lines 44+).

In etching the substrate of Kawama, et al it would have been obvious to one of to use an etching mask including chromium, since Flanders teaches that this is a convenient method to form an etching mask for a silicon substrate to be etched in KOH. Although it is well known that chromium alone would be unsuitable as an etching mask in KOH, Flanders teaches that chromium can be used in combination to form a mask for sequential etching steps.

It would have been obvious to one of ordinary skill to wait until the V-shaped grooves of Kawama, et al are completely formed before ending the etching process, in the interest of obtaining groove profiles having the desired cross-section, as fairly suggested by Flanders. Further, it would have been obvious to remove the mask after etching as taught by Flanders, since the mask is known to interfere with subsequent processing steps, and would likely have varied the amount of light transmitted through the substrate of Kawama, et al. Kawama, et al clearly teach away from any such variation (Col. 1, lines 38 – 50).

### ***Allowable Subject Matter***

Claim 45 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter:

The prior art, taken alone or in combination, fails to teach or fairly suggest *the combination* further comprising a coating of highly reflective material as recited in claim 45.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ozarski, et al (U.S. Patent Appl. Pub. no. 2001/0003035 A1) isotropically etch inclined surfaces in a silicon substrate using a solution of KOH and isopropanol.

Fujii, et al (U.S. Patent number 4,330,175) disclose a method of forming V-shaped grooves in monocrystalline silicon using aqueous KOH to obtain an apex angle of about 70.5°.

Magee, et al disclose a method of etching pyramids in a monocrystalline silicon substrate using a mask, an etching solution, and ionizing radiation to control the resulting reflectivity of the etched surface.

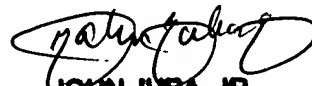
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SIEMENS A.G. (WO 97/32341) disclose a crystalline substrate which may be of silicon, the substrate having regions of varying reflectivity alternating across the substrate surface, the regions being formed by etching.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (571) 272-2314. The examiner can normally be reached on Mon.-Fri. 9 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Drew Dunn whose number is (571) 272-2312 and who can be reached on Mon.- Thu., 9 - 5.

The centralized fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for *all* communications.

  
**JOHN JUBA, JR.**  
**PRIMARY EXAMINER**  
**Art Unit 2872**

December 6, 2004